943. *In dilute nitric acid.*—Lead produced no effect at the first moment; but afterwards an electric current, gradually increasing in strength,, appeared; which was able to deflect the needle 20° or more, the hot metal being negative. Cadmium gave the same results as lead. Tin gave an uncertain result: at first the hot metal appeared to be a very little negative, it then became positive, and then again the current diminished, and went down almost entirely.

944. I cannot but view in these results of the action of heat, the strongest proofs of the dependence of the electric current in voltaic circuits on the chemical action of the substances constituting these circuits: the results perfectly accord with the known influence of heat on chemical action. On the other hand, I cannot see how the theory of contact can take cognisance of them, except by adding new assumptions to those already composing it (862). How, for instance, can it explain the powerful effects of iron in sulphuret of potassium, or in potassa, or in dilute nitric acid; or of tin in potassa or sulphuric acid; or of iron, copper, tin, etc., in muriatic acid; or indeed of any of the effects quoted? That they cannot be due to thermo contact has been already shown by the results with inactive metals (919, 929); and to these may now be added those of the active metals, silver and copper in dilute nitric acid, for heat produces scarcely a sensible effect in these cases. It seems to me that no other cause than chemical force (a very sufficient one), remains, or is needed to account for them.

945. If it be said that, on the theory of chemical excitement, the experiments prove either too much or not enough, that, in fact, heat ought to produce the same effect with *all* the metals that are acted on by the electrolytes used, then, I say,

that
that does not follow. The
force and other circumstances
of
chemical affinity vary almost
infinitely with the bodies exhibit-
ing its action, and the added
effect of heat upon the
chemical
affinity would, necessarily,
partake of these variations.
Chemi-
cal action often goes on
without any current being
produced;
and it is well known that, in
almost every voltaic circuit, the
chemical force has to be
considered as divided into that
which
is local and that which is
current. Now heat frequently
assists
the local action much, and,
sometimes, without appearing
to be
accompanied by any great
increase in the *intensity* of
chemical
affinity; whilst at other times
we are sure, from the chemical
phenomena, that it does affect
the intensity of the force. The